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MINERALOGY OF SAMPLES FROM CANADA TALC, MADOC, ONTARIO

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MICROMEDIA

MINERALOGY OF SAMPLES FROM CANADA TALC,
MADOC, ONTARIO

by
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SUMMARY

Seven samples of drill core from the orebody of Canada Talc Mines Limited and four mill products from flotation tests were studied mineralogically to characterize the ore and to determine whether any fibrous material is present in it. It was found that the ore consists of talc, and contains tremolite, dolomite, mica, chlorite and calcite. Trace amounts of elongated talc grains, composed of stacks of ribbons of talc were found in the samples.

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ÉTUDE MINÉRALOGIQUE DES ÉCHANTILLONS DE
CANADA TALC, MADOC (ONTARIO)

par
W. Petruk*

SOMMAIRE

On a entrepris une étude minéralogique de sept carottes provenant du gîte de la Canada Talc Mines Limited et de quatre produits d'usine des essais de flottation afin de caractériser le minéral et déterminer la teneur en matière fibreuse. On a découvert que le minéral contient du talc, de la trémolite, de la dolomite, du mica, de la chlorite et de la calcite. On a trouvé aussi des traces de talc aux grains allongés qui se composent des couches de talc sous forme de rubans fins.

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INTRODUCTION

One of the objectives of the CANMET Minerals Research Program is the detection and appraisal of incidental asbestos in Canadian mines. This is particularly significant in industrial minerals mines such as those which might be sources of cosmetic talc.

This report on the mineralogy of seven samples of drill core and four samples of mill products was carried out with emphasis on the use of scanning electron microscopy to search for fibrous constituents.

SAMPLES INVESTIGATED

Seven samples of drill core, and 4 of mill products were received from B.W. Boyd, Industrial Minerals Division, Mineral Policy Sector, EMR in November, 1982. It was reported that the samples were submitted to EMR by D. Cook, Manager, Canada Talc Limited. The drill core samples were labelled:

- (1) East orebody, average ore, CT-82-8, 170', April 14, 1982
- (2) East orebody, dark ore, CT-82-5, 208', April 14, 1982
- (3) East orebody, tremolite ore, CT-82-6, 98', April 14, 1982
- (4) East orebody, surface alteration, CT-82-12, 20', April 14, 1982
- (5) Conley orebody, Conley-type ore, CT-82-7, 85', April 14, 1982
- (12) East orebody, best ore, CT-82-14, 20', April 12, 1982
- Cashel TWP C-81-1.

The mill products were labelled:

- (8) Test 1, flot product, 30 mesh, CT-92-9, April 14, 1982
- (9) Test 1, waste, 30 mesh, CT-83-9, April 14, 1982
- (10) Test 2, flot product, -40 mesh, CT-82-9, April 14, 1982
- (11) Test 2, waste -40 mesh, CT-82-9, April 14, 1982

METHOD OF INVESTIGATION

Thin sections were prepared from the drill core samples and studied with a petrographic microscope. Part of each drill core sample was

crushed, and the crushed portions as well as the mill products were analysed semi-quantitatively with the X-ray diffractometer to determine mineral quantities. Fine-grained fractions of the crushed portions and of the mill products were studied for asbestiform phases. This involved mixing the powder with water to produce a slurry, allowing the large particles to settle for two minutes, and removing a sample of the remaining slurry with a pipette. The fine particles in suspension in the sample were mounted on a millipore filter for study with a scanning electron microscope (SEM). The sample was scanned with the SEM until a field containing elongated or acicular grains was found. Photographs were taken to show the elongated grains, and qualitative energy dispersive analyses were performed for some of the grains.

RESULTS

X-RAY DIFFRACTOMETER ANALYSES

The approximate mineral contents of the samples, determined by X-ray diffractometer analysis, is given in Table 1. The error of analysis is unknown, thus the values provide only an indication of quantities.

Table 1. Semi-quantitative* mineral contents of samples

Samples No.	Type	Mineral (wt %)					
		talc	tremolite	dolomite	calcite	chlorite	mica
1	average ore	65	-	19	-	-	16
2	dark ore	21	-	12	-	-	67
3	tremolite ore	-	44	4	3	-	49
4	surface ore	26	-	6	53	15	-
5	Conley ore	4	15	69	3	-	9
12	best ore	83	-	12	-	-	5
Cashel Twp (C-81-1)		32	7	18	27	16	-
8	30 M, flot	10	7	29	18	-	36
9	30 M, waste	8	4	33	13	-	42
10	-40 M, flot	85	-	2	-	-	13
11	-40 M, waste	4	-	13	4	-	79
Cashel Twp						-	

*X-ray diffractometer analysis

PETROGRAPHIC MICROSCOPY AND SEM STUDIES

Sample 1, East Orebody, Average Ore

The sample is coarse-grained. It consists of talc, dolomite and mica and contains traces of quartz and elongated grains that look like serpentine in thin section. The talc occurs as felted masses that contain a few grains of dolomite (Fig. 1). The mica (muscovite) is present as large flakes that are generally in mica-rich layers and the dolomite occurs as grains and masses in isolated places. Some acicular grains are present in the fine-grained portion of the crushed sample (Fig. 2) and the ends some of the grains are split (Fig. 3). This frayed end does not have the characteristic appearance of asbestos but seems to be a stack of long narrow ribbons.

Sample 2, East Orebody, Dark Ore

The sample consists of coarse-grained mica (mainly muscovite) with some dolomite and talc interleaved between the mica flakes (Fig. 4). Traces of acicular grains were found in the fine-grained portion of the crushed sample (Fig. 5).

Sample 3, East Orebody, Tremolite Ore

The tremolite is coarse-grained and consists of massive tremolite (Fig. 6) that is partly replaced by sericite (fine-grained mica) along prismatic cleavage planes. Some calcite and dolomite are associated with the sericite. Numerous elongated prismatic crystals of tremolite are present in the fine-grained portion of the crushed sample (Fig. 7).

Sample 4, East Orebody, Alteration Ore

The sample is coarse-grained. It consists of calcite masses, felted masses of talc (Fig. 8), and chlorite interfingering with the talc. A trace amount of acicular grains was found in the fine-grained portion of the crushed sample (Fig. 9). They have the appearance of bent ribbons.

Conley Orebody, Conley-type Ore

The sample consists of massive dolomite that contains tremolite, sericite and talc along foliation planes or in very thin layers (Fig. 10). No acicular grains were found in the fine-grained portion of the crushed sample (Fig. 11) although a few elongated ones are present (Fig. 12).

Sample 12, East Orebody, Best Ore

The sample consists of felted masses of talc (Fig. 13), masses of dolomite, a few grains of tremolite and separate grains of mica. The talc and sericite replace tremolite leaving remnants of tremolite. Only trace amounts of the long, narrow ribbons are present in the fine-grained portion of the crushed sample (Fig. 14 and 15).

MILL PRODUCTS

The proportions of minerals (Table 1) in the 30 mesh flotation product and waste show that there had been no concentration of the talc. SEM photographs of the fine-grained fractions of the 30 mesh samples show trace amounts of elongate grains in both the flotation and waste products (Fig. 16 and 17).

The proportions of minerals in the -40 mesh flotation products and waste show a high concentration of the talc and indicate that dolomite and mica had been rejected (Table 1). The fine-grained fraction of the flotation product contains elongated grains (Fig. 18) in which the ends are frayed (Fig. 19). The -40 mesh waste product has very few elongated grains and contains a trace of prismatic tremolite grains (Fig. 20).

ELONGATED GRAINS (RIBBONS)

Several elongated grains were analysed with a scanning electron microscope equipped with a qualitative energy dispersive X-ray analysis system. The results show that they are composed of Mg and Si and some contain trace amounts of Al, K, Ca and Cl. They could, therefore, have the composition of either talc or chrysotile. A cross-section of the elongated grains (Fig. 21 and 22) show that they are composed of stacks of ribbons and the subdivisions seen at the ends of some grains (Fig. 23) are actually separation of the ribbons. A further observation shows that some of the elongated grains and ribbons are bent with sharp angles (Fig. 24 and 25). The significance of this feature is unknown. The above characteristics indicate that the elongated grains are fibrous talc or talc ribbons rather than chrysotile, in agreement with information supplied by the company. Transmission electron microscope analysis of the elongated grains is required to confirm this interpretation.

CONCLUSIONS

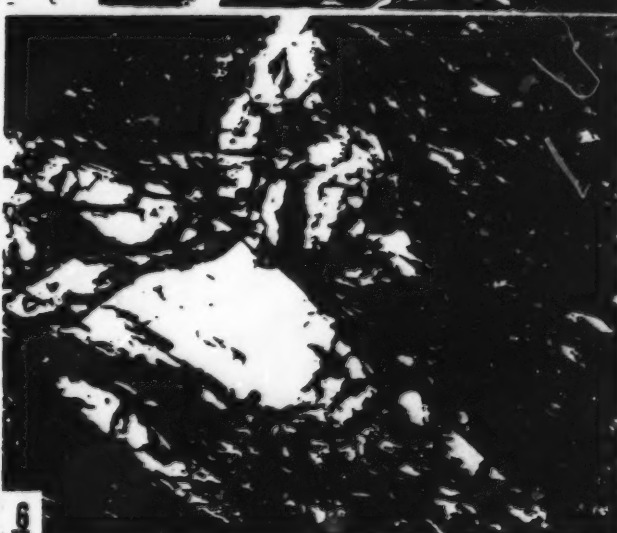
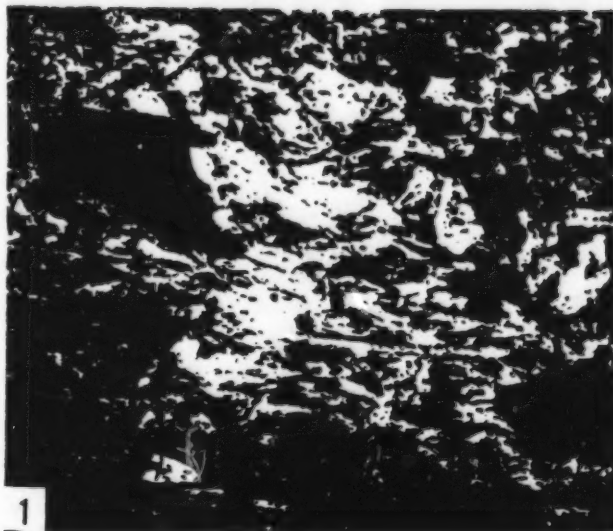
The main minerals in the samples studied are talc, mica, tremolite, dolomite, calcite and chlorite with trace amounts of elongated grains. The designation provided for the samples corresponds closely to the mineralogy of the samples.

No concentration was obtained by flotation of 30 mesh material, but good concentration of talc was obtained for the -40 mesh material. The fines in the -40 mesh talc concentrate, however, contain a few elongated grains that are interpreted to be fibrous talc or talc ribbons.

ACKNOWLEDGEMENTS

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- Fig. 1 Photomicrograph of thin section of sample 1, average ore, showing felted talc (light grey) and separate dolomite grains (dark grey to black).
- Fig. 2 SEM photograph showing several elongated grains in fine-grained fraction of sample 1, average ore.
- Fig. 3 Sample 1, average ore, SEM photograph showing frayed end of an elongated grain.
- Fig. 4 Sample 2, dark ore. Photomicrograph showing muscovite crystals with a few dolomite grains (grey) interleaved between them.
- Fig. 5 Sample 2, dark ore, SEM photograph of fine-grained fraction.
- Fig. 6 Sample 3, tremolite ore, thin section showing massive tremolite and some calcite (euhedral black crystal).



- Fig. 7 Sample 3, tremolite ore, SEM photograph of fine-grained fraction showing prismatic tremolite crystals.
- Fig. 8 Sample 4, photomicrograph of thin section showing felted masses of talc with interfingered chlorite.
- Fig. 9 Sample 4, SEM photograph of fine-grained fraction showing talc flakes and an acicular grain.
- Fig. 10 Conley-type ore, photomicrograph of thin section; dolomite with a grain of mica.
- Fig. 11 Conley-type ore, SEM photograph of fine-grained portion showing minute dolomite grains.
- Fig. 12 Conley-type ore, SEM photograph of fine-grained portion showing an elongated grain.

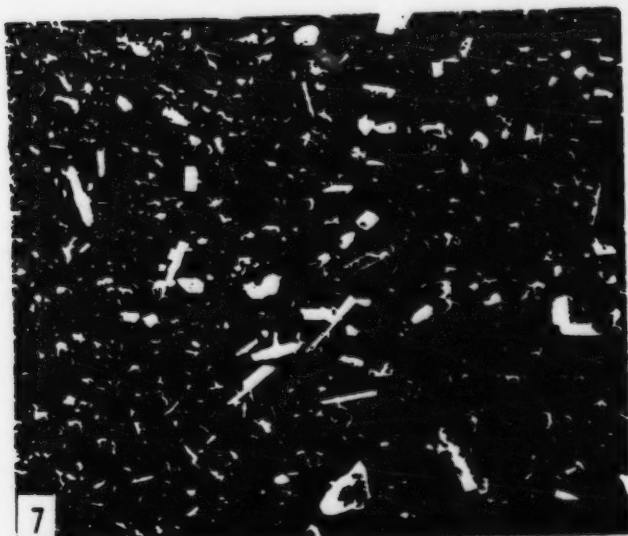


Fig. 13 Sample 12, East orebody, photomicrograph of thin section, showing felted talc.

Fig. 14 Sample 12, East orebody, fine-grained portion showing talc flakes and acicular grains.

Fig. 15 Cashel Twp, fine-grained portion showing talc flakes, tremolite and acicular grains.

Fig. 16 Test 1, 30 mesh, flot. product, fine-grained fraction, showing dolomite, talc, mica and one elongated grain.

Fig. 17 Test 1, 30 mesh, waste, fine-grained fraction showing dolomite, mica, and an elongated grain.

Fig. 18 Test 2, 40 mesh, flot. product, fine-grained fraction showing talc flakes and several elongated grains.

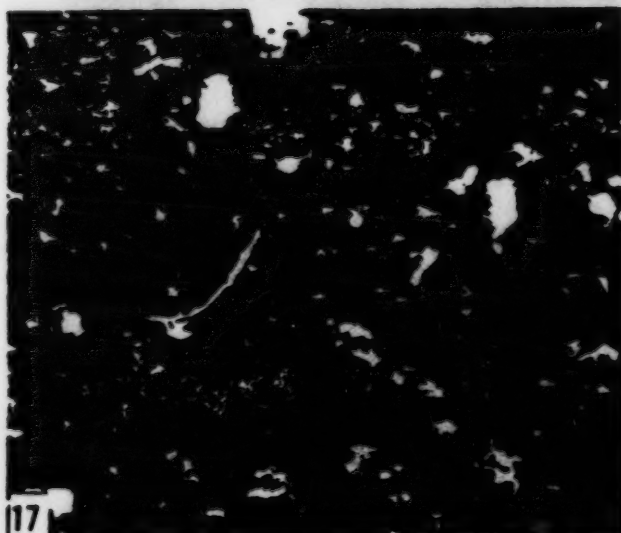
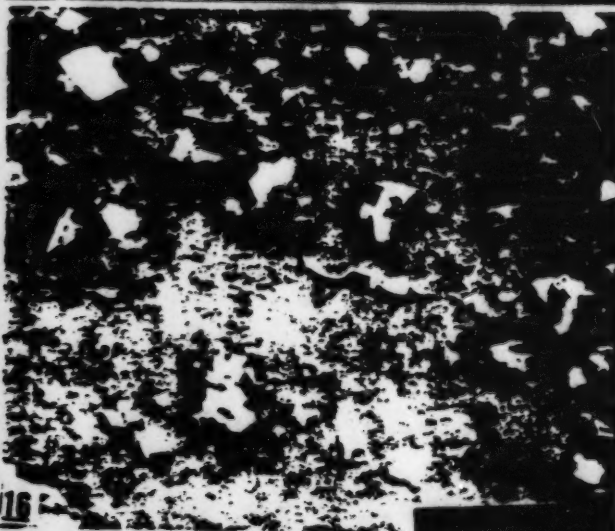
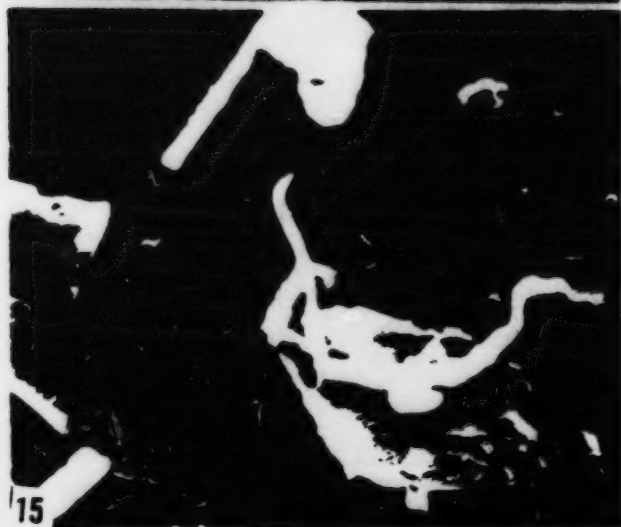
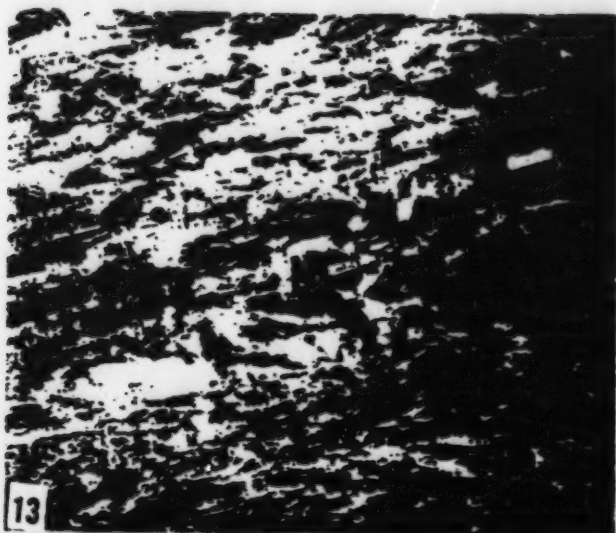


Fig. 19 Test 2, 40 mesh, flot. product, fine-grained fraction showing an elongated grain with frayed ends.

Fig. 20 Test 2, 40 mesh, waste, fine-grained fraction.

Fig. 21 Test 2, 40 mesh, flot. product, cross-section of elongated grain.

Fig. 22 Test 2, 40 mesh, flot. product, cross-section of elongated grain.

Fig. 23 Test 2, 40 mesh, flot. product, elongated grain with frayed ends.

Fig. 24 Test 2, 40 mesh, flot. product, elongated grain bent at a right angle.

Fig. 25 Test 2, 40 mesh, flot. product, elongated grain bent at a right angle.

